ILLINOIS TECHNOGRAPH

February
1942

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Fatigue of Metals

Auto Transmission

Wind Tunnels

Better Highways

Names in the News

Technocracked

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Left: Roads of tomorrow will be illuminated . . . see page 12. Lake Washington Bridge, Wash.

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FEBRUARY ★ 1942

This Issue . . .

THE TECHNOGRAPH

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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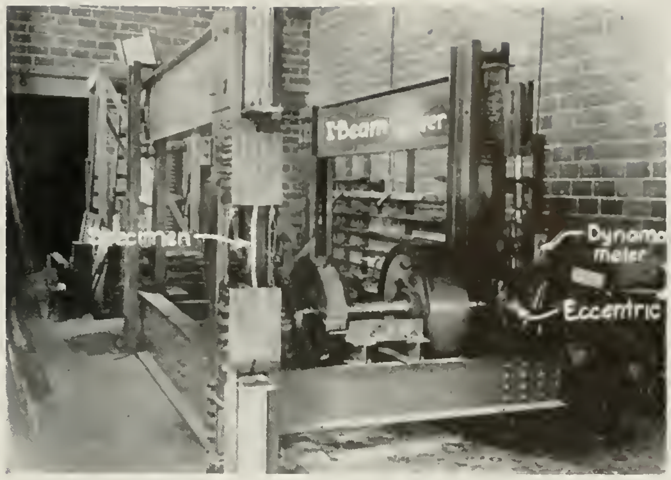
Illinois Leads . . .
Fatigue of Metals
Investigations

By William G. Murphy
Junior in Civil Engineering



Repeated loading of steel plate is obtained in this fatigue test machine.

"When you lift one end of a walking stick, why does the other end come up?" That's a good $64 question asked by Sir Oliver Lodge, an English physicist. My money is safe since the answer to that question has been sought by research men since the middle of the 19th century.

During the first period of interest in the subject, the physicists would have given a definition of the reason by speaking vaguely of cohesion between the particles. Wohler and Bauschinger were the pioneers in a field opened by the advent of railroad rolling stock with "live" axles. The turning axle is subject to "fatigue" failure. By fatigue I mean the apparent wearing out of the property of metal which enables it to withstand the stresses and loads to which it is subjected—that property which the early physicists called cohesion.

The years 1870 to 1910 marked a "depression" period in the investigation of "fatigue" of metals, but some work was carried on at the Watertown Arsenal. Rudyard Kipling joined Tennyson and others as a scribe prophet during this period by an uncanny anticipation of the most modern theories in his story, "Bread Upon the Waters."

The development of the automobile and the increase in the use of metal about 1910 caused a revival in interest which did not catch the University of Illinois napping. In 1907, H. F. Moore, research professor in the Department of Theoretical and Applied Mechanics came to the school and his interest in the subject caused the purchase of the department's first "fatigue" testing machine.

The testing machines used today are direct descendants of the first machine used by Wohler which was a laboratory adaptation of the rotating loaded car axle. The Materials Testing Laboratory at the University of Illinois, which is recognized as one of the oustanding labs in this field, has about 50 machines for testing metals. Forty of these are general equipment and the rest are used for a special project of Professor W. M. Wilson's.

Early in the investigations several views were published which although they were wrong did a lot to stir up thought and show the need for further tests. A good point of the engineering reasoning is based on the principal that a theory may be used if the error is on the safe side, thus the early work provided a solid foundation on which to begin other experiments.

One of these early investigations advanced a theory of "crystallization" which states that under repeated stress the metal becomes brittle (crystallizes). It has been proved with the microscopic equipment now in use that it was not "crystallization," but a progessive fracture—a crack which spreads each time the load is applied. Many of you have split wood by making a crack and then forcing the axe through by repeating pounding on the ground.

Since 1910 much progress has been made. It has been established that sharp niches, notches, and even rough surfaces increases the possibility of a "fatigue" failure. One of the big contributions of this university was in proving that there is a limiting intensity of internal stress below which the metal will not fail no matter how often the load is applied. This took a large number of tests and a long period of time. The longest test at the University of Illinois laboratories applied a load at the rate of 1500 times per minute for over 400 days with the machinery running constantly.

The lab was once open to visitors at their convenience, but now the men in charge insist that all visitors be escorted through. The reason being that some young boys messed up a test in an unguarded moment by flattening pennies under a load that was being applied to some full sized rails. These tests on rails were started under the leadership of Prof. A. N. Talbot, and a satisfactory solution reached in 1931. The experiments have been continued ever since in an attempt to get a better rail.

Prof. H. F. Moore has led the work at Illinois for some years and is now chairman of the ASTM Committee on "fatigue" of materials. At the present time 6 or 7 members of the research staff are engaged in the field carrying on the work already started by others and each putting to test his own original ideas on the subject.

The Navy Department of The Bureau of Aeronautics is indebted to the men here for a big percentage of the investigations made to determine the cause of failure in the parts of airplanes. Moore, Lyon and Alleman made some tests on the time between the appearance of the crack and the final fracture; Moore and Henwood reported on the stress by the constant tension on screw threads; and Moore, Kommers, and Thomas found a great difference between polished and scratched surfaces in effect on the failure. One of the most interesting investigations reported was by T. J. Dolan on the amazing effect of corrosion fatigue when combined with stress concentration by a notch, hole or fillet.

There is an experiment now in progress on the fatigue strength of a specially developed alloy for aircraft. Prof. W. M. Wilson is studying the "fatigue" in welded and riveted structural members. Among the other investigations are a study of the damage done by punching on soft sheet steel and the effect of making sharp corners for wing ribs out of aluminum. The most outstanding fact in recent years

Illinois is most proud of the fact that men trained in the undergraduate and graduate schools are making a name for themselves in "fatigue" at the testing labs to which they go from here. Men in the Department of Theoretical and Applied Mechanics make investigations which are presented in the text material of the up-to-date books written by other members of the department. This is the infallible combination which is becoming the "Tinkers to Evers to Chance" of modern education.

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Original Design . . .

NEW AUTOMATIC TRANSMISSION

By Tech's Dissatisfied Automotive Editor

By Robert E. McCleary
Junior in Mechanical Engineering

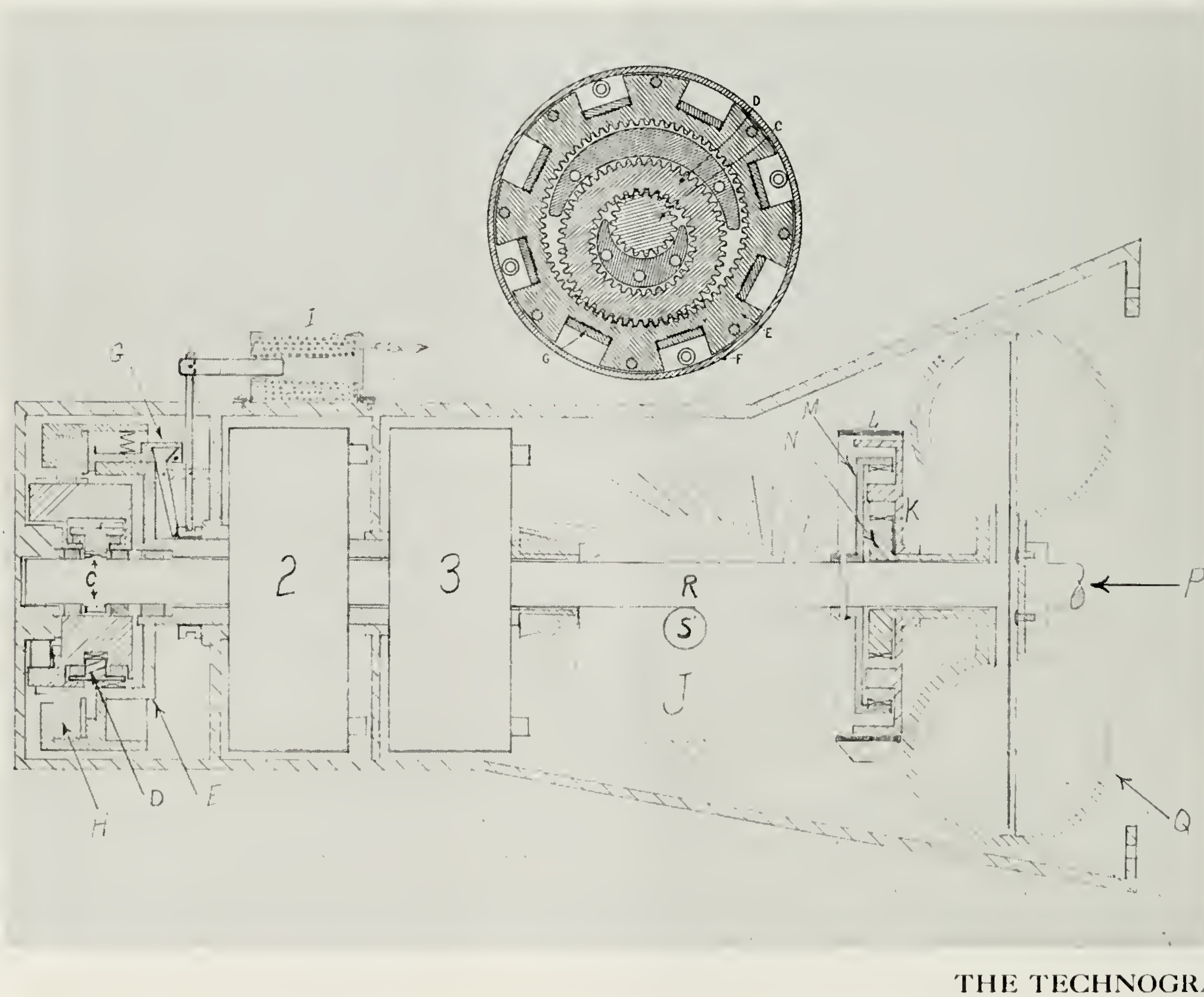
The placement of a gear reduction unit between the motor and wheels of an automobile is due to the shortcomings of the engine itself. The torque curve of an automotive engine starts from almost zero at idling speed and builds up to a maximum at from 1200 to 2000 R. P. M. Obviously, acceleration will be the greatest when the motor speed is in this vicinity.

In the past a manually operated clutch and a 3-speed manually changed gear-box was fitted to almost all American cars. Lately the shifting range has been augmented by a 4th, and higher, automatic speed known as 'over-drive' for high speed driving, which results in better economy and less wear due to a slower turning motor. "Kickdown" overdrive makes it possible to drop from cruising gear to third (direct) by depressing the accelerator to the floor, for increased accelerations needed for passing and hill climbing.

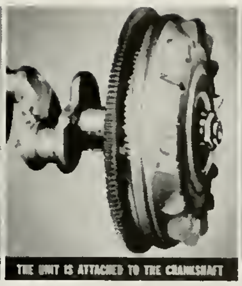
Then came the fluid drive and its incorporation into automatic transmissions of great complexity, as seen in Olds Hydamatic drive. This system consists of an involved valve mechanism for controlling oil pressure from two separate pumps supplied to operate 4 band and disc clutches.

Chrysler uses a fluid drive unit and a four speed transmission with two ranges of two speeds each. Each range is shifted automatically by vacuum. The clutch is unnecessary in starting, but shifting from one range to another necessitates its use.

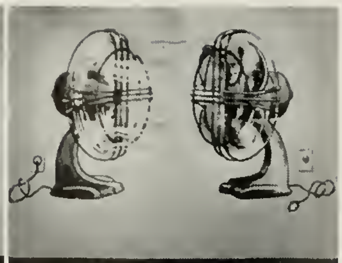
The complexity of General Motors Hydramatic automatic unit and the inadequacy of only two automatic shifts, even in conjunction with the fluid unit, of the Chrysler design has led the writer to design a transmission to suit his



ONLY TWO MOVING PARTS—THE DRIVER AND THE RUNNER



THE UNIT IS ATTACHED TO THE CRANKSHAFT



ILLUSTRATING THE FLUID DRIVE PRINCIPLE

own tastes of simplicity, compactness, and flexibility.

This design is pictured as applied to a car of front wheel drive design, which design is based on sound engineering principles of power application. After all motor weight makes the front wheels more tractive. Having the front wheels pull the car around a corner instead of the back wheels tending to push the car off the road is obviously sensible practice.

The transmission shown incorporates a fluid drive unit, as in Chrysler, 3 automatic units as used in 1933 by Reo, a new 'kickdown' mechanism, and a new reversing mechanism. All shifting is done automatically and mechanically by centrifugal force, with the exception of the 'kickdown' mechanism which is operated by a simple electric solenoid coil. Drawings are diagramatic, only.

THE FLOW POWER

. . . is through the fluid unit Q from crankshaft to sun-gear C via solid shaft R. Sun-gear C drives internal-external gear D and consequently internal gear in drum E. Power then goes through a sleeve around main-shaft R to unit 2 for further reduction. From 2 to 3, power travels for further reduction prior to finally driving differential J through the hypoid gear on sleeve at right of 3. Power reaches wheels through R.

THE FLUID UNIT

. . . consists of two moving parts, the driver and runner. They are alike and are made of pressed steel. They resemble two halves of an eaten grapefruit with partitions remaining and core removed. The unit is about ¾ full of oil. The driver imparts motion to runner much like one electric fan imparts motion to another disconnected fan placed in front of it. The medium is oil not air, however. Actually, in operation, the driver causes the oil to move outward from hub, accelerating each particle from 44 ft. per second to 96 ft. per second at 1000 R. P. M. In the driven unit the runner decelerates each particle from 96 ft. per sec. to 44 ft per sec. Such a decceleration multiplied by the mass of the oil is the force which must be absorbed by the runner. It is this absorbed force which is transmitted to the wheels. At high speeds the oil takes the shape of a whirling smoke ring, being like a rotating and whirling torus ring.

Insufficient torque is generated at idling speeds to move the car. As speed increases, the slippage decreases from 100% at 0 M. P. H. to 5 per cent at 10 M. P. H., and to ¾ per cent at crusing speeds. Thus a slight depression of the accelerator causes a standing car to glide away, replacing the function of the clutch. This unit replaces the flywheel and has the starter ring gear on its periphery.

THE AUTOMATIC UNIT

. . . consists of a novel arrangement of gears and a centrifugally operated disc clutch. Gear reduction is accomplished by sun-gear C meshing with slightly larger internal teeth on gear D, whose external teeth engages main gear E, thus driving the directly connected sleeve on which the sun-gear of the next unit is mounted. Gear E is free to rotate about a center which is 5-8 inch from the center of the main shaft. This center is also free to rotate about the main shaft, an over-running clutch being incorporated which does not permit parts to move in opposite direction to incoming rotation. Main internal gear E is concentric with C.

As speed of E increases, the governor weights G near rim swing outward because of centrifugal force and exert pressure which smoothly engages multiple disc clutch, H. This causes the automatic unit to revolve with shaft R as a unit, reduction ceasing. Units 2 and 3 are identical with the one just described.

The forward (left) unit has an additional mechanism attached which allows governor weights G to be returned to their original position at any time, permitting this unit to reduce incoming power even at speeds which normally causes the clutch to be engaged. This produces the 'kickdown' effect so essential for quick accelerations. This is accomplished by a solenoid coil I, drawing its armature inward, the resulting motion being transmitted through links and a shaft collar to a pin on weight G, which is depressed.

Why Front Wheel Drive was Chosen

Front wheel driven cars have long been used in Europe. The Indianapolis 500 mile races have proven their stamina and ease of handling. The author has been particularly inspired by one of America's foremost financial plungers, E. L. Cord, who brought in 1935 a car of unique and prophetic design. It was the front-wheel drive Cord, a car of splendid performance, high speed, and fine riding qualities, engineered far ahead of its time.

OPERATION

. . . From a standing start, the motor is speeded up by pressing accelerator. Torque is then sufficient to drive runner in fluid coupling and sun-gear C of left unit. Power then reaches wheels through units 1, 2, 3, all units reducing. This is 1st speed.

As speed reaches, say, 8 M. P. H., weights pivot outward and smoothly lock left unit in direct, reduction still taking place in 2 and 3. This is 2nd speed.

At about 15 M. P. H., the weights on 2 overcome a stronger spring and smoothly lock this unit in direct, giving 3rd speed.

At about 30 M. P. H., the weights in unit 3 lock this last unit in direct; all units are now locked in 4th speed and motion is from the fluid unit directly to the hypoid differential gear J, and thence to wheels.

At any speed above 8 M. P. H., the accelerator may be forced to the floor, closing a switch which causes solenoid I to operate, dropping the first unit into gear reduction once more.

All gear changing is smooth and without jerk or noise in these units, the oil immersed discs of the clutch engaging gradually. All weights return at proper time when speed is lowered.

The new non-automatic reverse is positive in operation, a foot pedal being used. With car stationary, foot pressure tightens band L, stopping drum K on which are mounted planetary gears which are turned by sun-gear N directly connected to the motor. Thus the power is transmitted to internal gear on drum M, which is bolted to shaft R, causing it to rotate oppositely to engine. Power does not travel through fluid unit. Actually, the runner now revolves in direction opposite to which the slapping oil tends to rotate it. However, at reversing speeds, this torque is slight and would be easily overcome by the positive drive through the band operated unit. In forward speeds, the band is off and the drum may rotate freely, allowing all power to pass thru fluid unit.

This transmission is believed by its author to be unsurpassed in simplicity, flexibility and compactness in the automatic field. The application is not limited to front wheel drives. Gear selection ranges may be altered for any set of speeds at will by increasing or decreasing spring pressure on respective governor weights.

CANNED HURRICANES

Speed Aerodynamic Design

By Robert E. McCleary
Junior in Mechanical Engineering

The Wind Tunnel and Models are Aviation's Laboratory and Guinea Pigs.

Millions of dollars are now being poured into aerodynamic research. Most of this capital goes into wind tunnels, which are more elaborate successors to the 22-inch square by 5-foot box in which the Wright Brothers placed models and fanned air through at 27 m.p.h., in 1903. From this first crude wind tunnel came facts for the construction of their first airplane to leave the ground.

Scale models of anything, skyscrapers, streamline trains, automobiles, transmission-line towers, bridges, and, of course, airplanes, can be easily made of wax or plasticine and placed in a wind tunnel for aerodynamic observation. These miniatures can be altered and re-tested in a few minutes time. In this article airplane testing only will be treated.

The basic principle of wind tunnels is that it makes no difference whether an object is moved through the still air, or is held stationary and air blown past it. The wind tunnel's purpose is to simulate the conditions of flight so that the dangerous and costly 'cut-and-try' process of altering full size planes and test-piloting them will be cut to a minimum.

Models are mounted on supports through which reactions in all directions are transmitted to a panel where they can be read directly from dials.

Two extremely important factors, the 'scale' effect (which physically represents the relationship between the inertia and viscosity forces acting on a body due to moving air) and the compressibility effect.

Above: Diagramatic drawing of Wright Field wind tunnel. Models are suspended upside-down and data is recorded automatically in a separate control beside the test chamber.

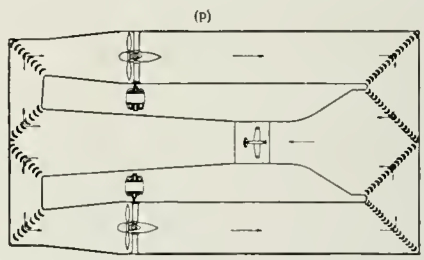
The first involves certain factors, and is measured by the Reynolds Number, i.e.,

$$RN = \frac{\textit{air density} \times \textit{air speed} \times \textit{length of object}}{\textit{viscosity of air}}$$

The extent of the effect of the second factor is represented by the March number, i. e.,

$$M = (\textit{speed of sound}) / (\textit{air speed})$$

In the compressibility phenomenon lies the reason for the oft-heard statement that 'man can never exceed the speed of sound.' Since air is compressible, any solid object moving



Above: Double return tunnel layout above requires less over-all length for same expansion of the air than the single closed return type, and less power than open end designs.

through it sends ahead a convex-shaped pressure wave which prepares the air for the object's coming so it can divide and flow around it. Actually, sound itself has nothing to do with flight; sound is simply the physical effect of this same pressure wave, the speed of which sets the upper practical limit for flight speed. If the object 'runs ahead' of this 'warning-wave', the effect is to produce shock waves offering large resisting forces to passage. It is much like slapping the surface of the water broadside with a canoe paddle instead of pulling the paddle smoothly through.

Though the speeds are still below 765 m.p.h., sound's speed, there are often eddy currents about certain parts of the plane which actually reach this speed. Propeller tips, air scoops, rivet heads, and cowling are main offenders.

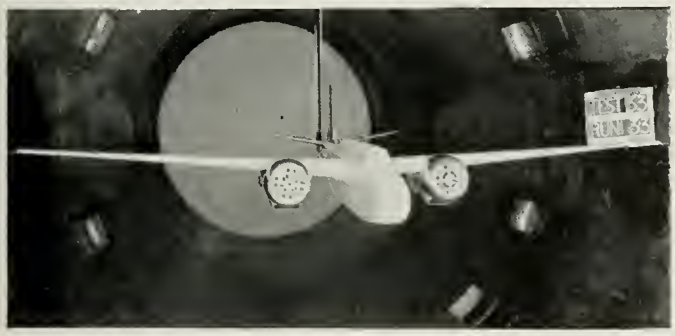
If model test data is to be strictly correct, the Reynolds Numbers must be equal. If the model is smaller than its flying counterpart, its RN is less. Obviously, to get equivalent Reynolds Numbers, the air speed and/or air density must be increased.

Actually, identical RN's are seldom achieved. However, at Langley field, a variable-density tunnel which can be pumped to 20 atmospheres has been built. The Wright Brothers tunnel at M.I.T., can be operated at a partial vacuum for high altitude simulation or at pressures up to four atmospheres.

A tunnel large enough to test full size planes would be desirable, but unpractical because of high power needed to produce wind velocities of today's pursuit ships. In Cha-

Right: 1,000-h.p. motors force an 118-m.p.h. wind past actual airplane in the N. A. C. A. full-scale tunnel at Langley Field. Air stream is 60x30 feet in cross section.

lais-Mendon, France, and at Langley field, Virginia, are the world's only tunnels large enough to test an actual pursuit ship. The one at Langley Field uses 8000 h.p. to create 118 m.p.h. of wind. It has a 60 x 30-foot cross-section. Power consumption of tunnels increases as the cube of the speed and the square of the crossectional area,



Above: Eight-foot model of a twin-engine bomber being studied for compressibility effects in the N. A. C. A. 500-m.p.h. wind tunnel.

thus making a 475 m.p.h. wind impractical, 512,000 h.p. being required for this tunnel.

Much valuable data can be obtained from tunnels of low Reynolds Numbers. Tunnels may be of the closed, continuous-circulation type, or open, where the air at atmospheric pressure is brought in from outside. No single tunnel provides all the answers, and many specialized types are in use.

Langley Field has no less than sixteen tunnels of various sizes and velocities. One produces a 500 m.p.h. wind in a section 8 feet wide. One is the full-scale tunnel already mentioned. Another is a vertical tunnel for tail-spin study. A 40,000 h.p. tunnel at Wright Field in Dayton, Ohio, will soon be completed. A 400 m.p.h., 20-foot wide current of air will be available to test models of 16-foot wingspread. A still larger tunnel is being built at N.A.C.A.'s Ames Laboratory, in California.

Certainly, aerodynamic research offers a big field to engineering graduates. While much is now being spent on military craft, the results will definitely be of great use in maintaining our national peacetime air superiority after the war.

Above: Wind tunnels have been called the world's largest precision instruments. This is the 19-foot variable-density tunnel at Langley Field.

Every Year Better HIGHWAYS . . . *Across America*

By Hayward L. Talley
Freshman in Electrical Engineering

TOMORROW

The building of roads began and progressed with civilization itself; historical notices remain sufficient to tell us brief stories of the road-building efforts of ancient Greece and of the Egyptians who took pride in their horses, chariots, and roads. To enlarge upon the history of ancient roads, we must then turn to a less ancient Roman Empire.

The roads of Rome were divided into two distinct classes, military and public. The methods of construction varied with the purpose. The military roads were in most cases sixty feet in width, of which space the elevated center occupied twenty feet. The public roads were often more remarkable for magnitude and breadth and for their straightness over surfaces of every kind than for smoothness or for general ease of travel. The roads were higher in the middle than on the side, and there were channels with small arches for carrying off the water. The roads were surfaced in one of three general ways, the general practibility determining which was used on each specific road: pebbles and gravel, flint-stones, and large flat stones laid with regularity. The latter is comparable to the brick streets of today.

Many striking examples of Roman skill in road designing and building still exist, the most outstanding being the great Appian Way, now well over two thousand years old. For many miles it seems to be in as perfect a condition as the day it was built. Roman roads spoke for themselves, and thus it came about that long after the fall of the Roman Empire, their proven methods of road construction continued to be used throughout Europe.

YESTERDAY

In America, during the early days of the English colonies, there was little need for roads. The settlers traveled by waterways or used the Indian trails which were suitable for a horse and rider or a pack train. In the latter part of the eighteenth century, the need began to arise for better lanes of transportation between settlements; as a result, private individuals cleared strips of timber and prepared narrow turnpike roads. These were very satisfactory in good weather, but gradually the need arose for a surfaced road suitable for year-around use. The United States Congress, soon becoming aware that ample lanes of transportation and communication were vital to the welfare of the young nation, began to make appropriations for road building, the various states usually carrying a larger part of the burden.

American road builders, having had little or no practical experience upon which to base their planning, began to use the English derivation of road-building used hundreds of years before by the Romans. Though our roads have been miracuously improved during the years of American road building, many of our highways today reflect the early Roman design.

With the advent of the automobile in 1892, travel speeds increased as rapidly as the roads would permit. In 1901 a trip was made by auto from Detroit to New York over a typical road in the record time of seven and one-half days. But that was in good weather. By 1904, there was only 144 miles of pavement considered to be adequate for all-weather use.

Probably the greatest stimulus to road improvement came with the passing by Congress of the Federal Aid Highway Act in 1916, previous to our entry into the first World War. During the following few years the need for well-constructed cross-country highways was seen as never before. Miles upon miles of hard-surfaced roads were constructed, linking together our many metropolitan areas. During the war these roads were given very grueling tests by our military vehicles. While a few seemed to meet requirements, on most others many faults were to be found. Pavements were as a rule far too narrow. Bridges were of an insufficient load capacity. Turns in the road were flat and square. In many cases the pavement itself failed to "stand up" due to a lack of knowledge concerning proper mixtures and reinforcements under various conditions.

Road building efforts previous to and during the first World War were designed to pull motor-transportation "out of the mud." In this respect the efforts were not fruitless.

Later efforts were concentrated on ironing out difficulties previously encountered, and thus prepared to meet the needs of a motoring public. Today the United States has one-third of the 9,000,000 miles of the world's highways, most of which is well-constructed two-lane pavement. Certainly under any ordinary situations our highways which together cover over 1,000,000,000 acres, would be adequate.

But ordinary circumstances do not exist. While we have 1/3 of the world's highways, we have four-fifths of the world's vehicles. Further, with each passing day additional burdens are placed on our roads by their increasing use by our military forces and defense industries.

During 1940 on the program of national defense there was designated a strategic network of military highways throughout the United States (known as the Pershing Map.) Various state highway departments were requested to prepare estimates of improving the highways and bridges up to a certain minimum standard, so that they could be used for quick movement of heavy army trucks as well as special equipment. Highway engineers predict that these circumstances will bring about a second new era of road construction.

Looking to the future we see a country which is rich in natural resources and natural beauty; a country whose engineering genius has provided for national security and defense without neglecting to design for its citizens comforts and luxuries of life such as the world has never known. Our cities will manifest the wonder and splendor of an age of invention and mechanics, our roads will be the super-highways of the motorists' dreams.

All bridges will be wide and magnificent in design. Grade separations will be provided at all intersections. All ditches will be closed. Our super-highway system will be well lighted. No telephone or power line poles will be seen, for all wires will be carried underground. The wide lanes of traffic will be divided by picturesquae green, shady parks, providing picnic areas, playgrounds, and comfort stations.

TODAY

Yes, America, during the brief span of your national life you have wrought miracles of invention and discovery which have revolutionized the world and advanced civilization a thousand years in a single century. The vast wildness has melted away, and the new continent swings between the seas like a huge and beautiful hanging garden—the America of Tomorrow.

NAMES

. . . *in the news*

By William R. Schmitz
Freshman in Chemical Engineering

BILL COONCE

Cadet Major Bill Coonce is one of the most active military men on the campus. He is commander of the Phalanx, member of Pershing Rifles, T.N.T., and A.S.M.E. He says that military is his first love, and wants to stay in the army for good.

Bill is a mechanical engineer and lists aero-dynamics and design work as his favorite subjects. He also found that Spanish was very worthwhile and has made it one of his interests. Other hobbies of Bill's are stamp collecting, model airplane building, swimming, and fencing.

As we said before, Bill's main thought is military. And one of the reasons that he chose Illinois as his school is because of the large R.O.T.C. unit here. Bill thinks that the quality of men in the R.O.T.C. is constantly improving because of the national defense. He says that he has gotten more out of military training than any other thing here at the university. He comments, "It is a big help to you, and tends to make you a leader in outside activities."

Bill thinks quite a bit about two military organizations here on the campus, Pershing Rifles and Phalanx. According to Bill, Pershing Rifles is the best military organization in the country. There is no parallel to that organization for the training of basic course students. Illinois has one of the largest units in the country. Phalanx, according to Bill, is "tops." Quoting from him, "We consider the boys in advanced R.O.T.C. the cream of those in military, and the boys in Phalanx are the cream of the cream."

FRANCIS WEIR

Hailing from St. Louis, Missouri, is Francis Weir, "sanitary engineer to be." Quite naturally he is thoroughly "wrapped up" in sanitary engineering. Francis stayed out of school several years and during this time he got some experience working at a water works plant. It was this work that really influenced his choice of profession.

After spending his first year at the University of Kansas, Francis transferred to Illinois. Admitting Kansas is a good school, he thinks its engineering school could compare in no way with Illinois. He did add, however, that Kansas had a very pretty campus, and was probably a little more democratic than Illinois.

The goal of Francis (and many of the rest of us) is to make a lot of money and then settle down and loaf in a nice comfortable home. In order to attain this, he expects to go into sanitary construction work, or possibly into public health or research work. Sanitary designing has especially appealed to him here at school. Incidentally, he thinks that it is a very good idea never to put off until tomorrow what you can do today. And he gives that reason for his scholastic average of 3.9.


BILL


FRANCIS

Francis is vice-president of Mu San, honorary sanitary engineering fraternity. Yes sir, for a fellow who has gone through earthquakes, train wrecks and explosions, he is a very quiet mild mannered engineer.


JOHN


CHARLES

JOHN LESSNER

That handsome chap with the appearance of Clark Gable is John Lessner. Most of the girls could go for John in a big way if he would let them, but he has a certain *one* back home at Shurtleff College in which he is quite interested. John lives at Alton, Illinois and so spent his first two years at Shurtleff, where he was on the varsity track and tennis teams.

John is a true sportsman, enjoying hunting, fishing, and all outdoor sports along with his hobby, photography. Nothing would please John better than some day to be able to become a retired sportsman. He would like to take an extended cruise on a sailboat and fish for days at a time if he so chose. He might be content to go to movies and to read. Beware, for his pet peeves are scatter-brained women and people who talk too much.

John is a member of Tau Beta Pi, Phi Kappa Phi, vice-president of Pi Tau Sigma, publicity chairman of A.S.M.E., M.I.D.A., and a member of the Mi-Hila ball committee.

Laboratory and machine shop courses have proved particularly interesting to John. He sports a very excellent scholastic average of 4.94. John has had several offers from different companies, but he believes that he will either go into research work for the Ethyl Gasoline company or take a position as test engineer for an airplane company at Hartford, Conn.

The objection that John raises to the mechanical engineering curriculum is that it needs modernization. He feels that text books should be brought up to date, and the courses presented in a more interesting way. At the present time John is doing a thesis on plastics under the direction of W. N. Finley of the T.A.M. department.

(*Please see page* 18)

TECHNOCRACKED . . .

By Edward C. Tudor
Senior in Electrical Engineering

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We understand that a recent F. B. I. investigation disclosed that ten per cent of the population earns its money by criminal pursuits. Obviously this doesn't include gag writers.

We were at a loss for material this month, but a glance at the headlines reminded us that Italy still professes to be at war with the Allies. For example one headline was: Mussolini Discusses War with His Generals. They must have been reading about it. No longer need Il Duce urge Italians to "live dangerously." The British are taking care of that.

It looks as though we will have to make tanks to whip the Germans, planes to use on Japan, and a repeating peashooter to annihilate the spaghetti eaters.

Then there's the pigeon who was sunning himself on the Tower of London when a friend flew by. "Hello Bill," he said, "How are you." "I'm fine," said the first pigeon, "but my brother is all tired." "What's he been doing," asked the friend. "Well," answered the first, "he took a little flight over Libya last week . . . and before he knew where he was, he had brought down twelve Italian planes, single-handed."

They tells us that beyond the Alps lies Italy. So what? Beyond the billboard, lies America.

Churchill on his visit to America apparently has an Axis to grind. He is quoted as saying that co-operation between Great Britain and Russia is as close as "geographical and other conditions allow." "Other conditions" couldn't mean the German army, could they, Mr. Churchill?

News item—"British forces fall back." This is where we came in on the first feature.

War has some blessings, anyway, for so great is the demand for steel the number in new shirts will have to be reduced.

One of the air raid instructions needs no emphasis for College students. It says, "Get under a heavy table." If this is all that's necessary, an air attack New Year's Eve would be a total failure. If accompanied by a blackout, the country would look like prohibition was here to stay. People will enter a bomb-shelter by knocking twice and furtively whispering, "Joe sent me."

Our private solution of the Japanese situation:—One thousand AFL workers placed on a Pacific isle would stop the Japs cold with a jurisdictional dispute.

Insurance statistics tell us, "People 70 can expect to live nine more years." Those between 18 and 44 cannot all have the same expectancy.

"Germany has no desire to injure her friends," say the *Berlin Angriff*. As a matter of fact, Germany can shoot in almost every direction without fear of hitting friends.

Morgenthau says the United States must feed the people of Europe. Well, there are fewer of them every day.

"The food resources of America set world record."—*St. Louis Star-Times*. Now, if they will just price it so we can buy it, we'll eat it.

California announces they produce 50 per cent of the lemons. The other 50 per cent must be voluntary residents.

Another headline:—"Record Amount of Water Used Here." Somebody must be drinking the stuff.

And another:—"Boy's Throat Coughs Up Single Nickel." Try again, Doc; you might hit the jackpot.

We see where Harvard has a course in ditch digging. They'll be giving WPA degrees next. Queer things happen at institutions of higher learning. For example there's the wire-haired terrier that has been enrolled as a student at Syracuse University for three years. We know a few professors who should be registered with the American Kennel Association.

We were asked the other day if you can call an ex-sorority girl a fugitive from a Jane gang. It wouldn't be the healthiest thing one could think of.

Then there's the Engineering Assistant who couldn't afford to play golf, so he threw an aspirin tablet on the front lawn and spent the afternoon looking for it.

Norman Bel Geddes predicts the automobile of the future will have a 150-inch wheelbase. The width will undoubtedly remain the same as that of a prostrate pedestrian.

Now they have an airplane that flies with no human intelligence to guide it. Heretofore, only automobiles made a practice of it.

If history repeats itself the American taxpayer would do well to take heed to the story of Percy Lister, member of the British Purchasing Commission.

In 1937, he and associates purchased an established business then running in the red. Under new management it prospered; last year showed a profit of $1,500,000. But the owners didn't get a nickel; in fact, owed the gov't money. Here's why:—

On the $1,500,000 profit the tax was 50%—$750,000. In addition, where profits are over $1,000,000, the gov't takes 100% of the first $1,000,000. That made the tax, according to gov't figures, $1,750,000. The owners protested that they had made only $1,500,000.

"That's quite all right" said the tax official. The gov't has made provision for such cases. We will take a mortgage on your plant, and lend you the $250,000 necessary to pay your tax." Quick, Jeves, my slipstick!

We surrender to the printer with this parting shot:—If nobody quit high school who would there be to hire college graduates?

NAMES in the NEWS

. . . from page 14

CHARLES NEAS

The man you see behind all those test tubes, retorts, and other chemical apparatus is none other than our friend Charles Neas. He comes to Illinois from the deep South, claiming Johnson City, Tennessee as his home town. Since Tennessee State is located at Johnson City, Charles spent his first two years there before transferring to Illinois. At Tennessee State Charles was on the debating team, but since coming to Illinois he has not had extra time to spend in outside activities.

Urging that chemical engineering be transferred from L.A.S. to the College of Engineering, Chuck also thinks too much emphasis is placed on grades.

Charles is a member of Sigma Tau, Tau Beta Pi, and American Institute of Chemical Engineers. Since he is a chemical engineer, Charles explains he doesn't find much time for hobbies or social life, and he confined most of his entertainment to the current "flickers" in various theaters.

Having a fine 4.897 average, Charles is allowed to do some research this year. At the present time he is working on a method of liquid extraction in which a continuous flow of liquid is kept in several tubes and the extraction depends on the character of the molecules instead of the size of the molecules. Of course no one but a chemical engineer will understand this process but it sounds interesting.

Charles is looking forward to getting a fellowship at M. I. T. There he intends to do some research and developing, but he doesn't know for sure whether or not he will continue his work on continuous liquid extraction.

HEIGHTS of CLOUDS

Measured With

MERCURY LAMP

A tiny, 1,000-watt mercury lamp developed by General Electric for searchlights and television studios has been used to solve a vital problem of aviation—the daylight measurement of the height from the ground of clouds.

Maurice K. Laufer and Laurence K. Foskett of the National Bureau of Standards discovered that by projecting the light from one of the high intensity water-cooled quartz mercury lamps, and noting with a photoelectric eye the "splatter" of the light where it hits the cloud, that the altitude can be calculated by triangulation.

"During the daytime," they explain in the Journal of Research of the National Bureau of Standards, "dark overcast clouds at an elevation of 9,000 feet have been readily detected. For cumulus clouds illuminated by direct sunlight and having elevations up to 4,000 feet, the detection is positive."

The projector consists of the lamp located at the focus of a 24-inch parabolic mirror having a 10-inch focal length. The "electric eye" detector consists of a vacuum-type phototube placed immediately behind a diaphragm with a slit opening 3/25 by 11/16 inch located at the focus of an eight-inch plano-convex condensing lens.

The narrow beam from the 1,000-watt lamp is projected into the sky at a frequency of 120 flashes per second and the rays scatter when they hit the clouds. This light scattering is detected by the photoelectric eye located at a known distance from the lamp and adjusted for this flash frequency that will distinguish the beam from background atmospheric light.

The cloud height then is determined by the solution of the right triangle formed by the line of the beam to the clouds, the angle of the electric eye sight upon the clouds and the base line connecting the beam projector and the phototube.

The Bureau of Standards scientists developed the method at the request of the United States Weather Bureau which at present employs small helium-filled captive balloons for the job. The balloons are reeled out like kites and observed through optical instruments. When the balloon disappears into the cloud, its height is estimated by the length of played-out line.

Sometimes these balloons are equipped with instruments for recording the temperature, pressure, and humidity at various altitudes. From these readings, cloud heights are calculated upon the basis of previous records and the result checked against the visual observation.

The quartz water-cooled lamps are the outgrowth of the search for a small light source of high brightness and efficiency and are possible because the industry now has available new glasses and sealing technique for quartz bulbs. The 1,000-watt lamps have been available commercially in this country for about three years. Single lamps of this type were used in the 16 searchlights whose beams crossed the Court of Peace in the New York World's Fair.

Doctor (after examining patient): "I don't like the looks of your husband, Mrs. Brown."

Mrs. Brown: "I don't either, Doctor, but he's good to the children."

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Saved Until Last

He was one of those persons one does not often meet at parties, and luckily, but there he stood, with his great white beard and commanding brow, looking triumphantly over the young faces about him. "I'm seventy-eight years old," he declared proudly, "and never tasted strong liquor, used vile language, or indulged in the excesses of smoking in any form. What is more, I have worked harder than any man I have ever known."

A young man near him sighed, "What a tragedy!"

"Tragedy!" exclaimed the octegenarian.

"Yes, tragedy," replied the young cynic. "I can understand your not drinking, your refraining from smoking, and your distaste for wild women and vile language, but what in hell did you work for?

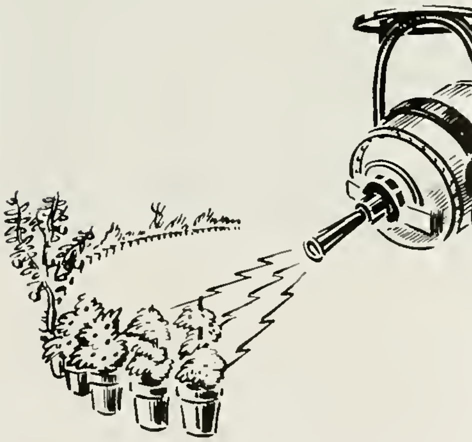
G-E Campus News

UNDER ONE ROOF

THE General Electric Company has a leased-wire communication system which functions as smoothly as if all G-E branches were housed in a single building.

During the year 1941, a total of 3796 miles was added to the leased-wire communication system to help speed the handling of contracts. A network of 11,565 miles is now available for telephone and teletype messages.

The telephone network covers 5630 miles and serves 17 key industrial cities in the East and Middle West. It contains 37 individual wires, many of which can be interconnected for greater flexibility and coverage. The teletype network comprises 4822 miles of full-time circuits and 1113 miles of part-time circuits. Thirty-one cities are served directly, and many others are served indirectly.



VOLTS AND VITAMINS

THE General Electric industrial X-ray laboratory recently moved a large number of apple and other fruit trees, berry bushes, and tomato and string bean seeds into the confines of its workrooms.

There, under an X-ray machine, these various specimens of flora were bombarded with 1,000,000-volt X rays. They were then returned to the New York State Experiment Station at Geneva for planting and subsequent observation of the effect of the X rays upon the color, size, flavor, quality, resistance to disease, and other characteristics of the fruit and vegetables.

Variations and mutations are to be expected when living plant cells are subjected to bombardment with X rays. Under forced germination, effects of the 1,000,000-volt treatment on seeds may be observed within a few days, but, for the young trees and berry bushes, the full effect will not be known for at least five years.

LE DERNIER CRI

THE General Electric Company's construction of the first large electric plant in the Belgian Congo was stalled by the lack of dowel pins, the only items missing from an inventory of hundreds of parts. The whole camp was searched, natives were questioned, but not a single dowel pin was found.

With a 90-day deadline, replacements were out of the question, so, with makeshift materials, tools, and help, new dowel pins were fashioned. The job was finished on schedule.

Months afterwards a visitor to a half-savage tribe in the Belgian Congo found men and women alike wearing a new type of nose ornament. Thrust through the cartilage of the nose, gleaming and twinkling in the African sunlight, the missing dowel pins were the pride of the natives.

GENERAL ELECTRIC

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